

A number of the migrating larvæ taken into the insectary and placed in a cage, containing some oak leaf mold into which they soon dispersed and fed rather actively for several days. About three days later on lifting layers of the mold, I noticed that most of the larvæ had transformed to delicate yellow pupæ. No accurate record was made of the time passed in the pupal stage but this was probably about two weeks.

On July 16, 1913, a little over a year after the first observation, a second army of the worms was noticed. This was also found in the town of Fayetteville, only a few hundred yards from the locality where the observation of the previous year was made. The army was much smaller than the one noticed last year (1912), probably not more than three feet long.

Some of these larvæ were kept and pupated about one week after they were transferred to the leaf mold. The adults emerged probably two to three weeks later, during my absence. This insect proved to be the same one observed last year. Specimens sent to Prof. O. A. Johannsen were determined by him as a new species. They are described in the present issue of *PSYCHE* under the name of *Sciara congregata*.

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## NATURAL ENEMIES OF SIMULIUM: NOTES.

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In the concluding paragraphs of his paper on "American Black Flies or Buffalo Gnats," Bulletin 26, Technical Series Bureau of Entomology, April, 1914, the author, Mr. J. R. Malloch, calls attention to the occurrence of parasites of the larvæ found in Illinois, and also found by Mr. E. H. Strickland near Boston, Mass.

In the last paragraph of his paper, Mr. Malloch refers to some work done by agents of the Bureau of Entomology many years ago. As this reference leaves the matter somewhat obscure, it may be stated that on May 6, 1888, while studying Simulium in the St. Francis River, near Madison, Ark., the writer found a Simulium larva about one-fourth grown, presumably belonging to what was then known as *Simulium pecuarum*, infested by some

species of Nematode worm which had every appearance of being an internal parasite.

Under the same date it was mailed to Division of Entomology, where it was duly received and given a division number 3498°. Doubtless the specimen has long ago disappeared, but it is this to which Mr. Malloch refers in his paper and may perhaps belong to the same species as was later found infesting larvæ of *Simulium* in the Sangamon and Illinois Rivers, and which Mr. Strickland years after has been able to carefully study.

On May 11, 1887, the writer while engaged in studying buffalo gnats and other species of *Simulium* in the St. Francis River at Madison, Ark., encountered a species of fly which were locally termed "black gnats." These acted very much like true buffalo gnats, although I was not able to observe them biting animals. Specimens were mailed to the Department of Agriculture and the notes of the Division of Entomology show that they were received May 14, 1887, and given the division number 4133. They were described as agreeing closely with the genus *Hilara* but differing by having mouth organs longer than the head, and by possessing a stigma-like black spot near margin of wings. A year later, or to be exact, May 6, 1888, the writer was again in the same locality engaged in the further investigation of *Simulium* and again encountered these flies in abundance. It would seem that, as they belong to a group known to be predaceous, they were presumably attacking the gnats, although I do not find that this was actually observed by me.

While camping on Devil's River, about fifty miles from the point where it empties in the Rio Grande, March 20 to 25, 1891, larvæ, pupæ and adults of a species of *Simulium* not recognizable as belonging to either *S. pecuarum* or *S. meridionale* were found in abundance. Specimens of all stages were forwarded to Washington where they appear to have been received May 9, and given the division number 5003. One of these adults, captured while in the act of attacking a horse, was infested by larvæ of a water mite, division number 5003°. This is the larva of a Hydrachnid agreeing with *Limnesia*.

A precisely similar observation was made by myself July 30, 1884, at Oxford, Ind., where an adult mosquito was discovered with one of the water mites attached thereto.

With reference to the discussion of *Simulium pecuarum* Riley, pp. 21–24 of Mr. Malloch's paper, and the note attached thereto, it may be stated that both males and oviparous females occurred in abundance and were sent to Washington from Somerset Landing, La., during April, 1886, and also the spring of both 1887 and 1888. As a matter of fact, the egg-laying female and the male do not usually travel far from the localities where the species breeds, the males apparently never following the biting, sterile females. The oviparous females were found to each contain 500 to 750 eggs. Oviposition was observed March 27, 1888, and hatching was witnessed the following day.

The specimen, to which Mr. Malloch refers as having been collected at College Station, Texas, was obtained in sweeping a field of wheat on the college farm, February 24, 1891, while the following day both larvæ and pupæ were found clinging to driftwood in the Brazos River, seven miles away.

An abundance of material was sent from both Somerset Landing, La., and Madison, Ark., during the years 1886 to 1891. While pupæ will not develop adults if kept in stagnant water, nevertheless eggs of this species hatched en route between these points and Washington, and pupæ, packed in Spanish moss in cigar boxes, frequently develop adults also en route.

Both this species and *S. invenustum* were observed attacking stock in the White Rock Mountains near Vineland, Ark., February of the same year. Specimens were sent to Washington, and received the division number 4094B. The other sendings to which this note refers were from Pecos Creek above Marble Falls, Texas, March 7, and Cypress Mill a few days later. Other material, belonging to *S. venustum*, was sent to the Department March 19 and 23, 1887, when the females were observed ovipositing at Somerset Landing, La.

*S. meridionale* was sent frequently during the years 1886 to 1891 from both Somerset Landing, and from Madison, Ark., the latter collected in the St. Francis River. *Simulium* were also collected and forwarded to the Department from Elk Horn Falls on White River, just below Richmond, Ind., May 14, 1892. Also, specimens of two species from the Wabash River, near New Harmony, Posey County, Ind. A number of head of stock were killed

in that vicinity in 1884, and they were again quite troublesome in 1890.

In the case of sendings from Wooster, Ohio, some years after these dates, a farmer complained of flies getting in the ears and nostrils of his horses while being worked in a particular field near a brook, originating from a spring, and running over a rocky bed. Specimens of the adults were submitted and determined as *S. pecuarum* Riley, but I find no record of this in the Bureau notes on Simulium. If I remember correctly in this Wooster, Ohio, case, the difficulty was eliminated by pouring crude petroleum into the spring, allowing it to be carried down stream by the running water.

Prior to the outbreak of the war, the levees of the Mississippi River were continuous through the alluvial country and kept in good repair. With the outbreak of the war, however, when sterner matters overshadowed everything else, the levees were neglected, and in many cases caved into the river.

Soon after this time, as cavalry and artillery officers of both armies have since assured me, there were severe losses of both horses and mules in their respective commands. From this time onward to 1886, the buffalo gnat became such a scourge, killing in many cases every horse and mule on a plantation, that their appearance came to be greatly dreaded.

It is the remembrance of those days when both domestic animals and occasionally a human fell a prey to these flies, that remains to be refreshed in the minds of the people even to this day, whenever the levees give way and overflows occur during the spring time. There is, however, practically no danger whatever from a return of such disastrous outbreaks of buffalo gnats as formerly occurred. The gnats do not breed in the Mississippi River itself, and it will require more than one season's overflow to enable them to increase in numbers sufficient to become a menace to domestic animals.

The writer has been bitten by these gnats until his face and neck were so blotched as to render shaving impossible for weeks. Civil engineers working on the St. Francis River, during excessive abundance of buffalo gnats, suffered severely from their attacks. The gnats would make their way down their necks and under their clothing, and also down their rubber boots and collect there about

the angles. I have seen such men months afterwards with the calves of the legs and the ankles discolored as though the limb had been beaten or severely bruised. It may be stated in this connection that pellagra was not at that time recognized in this country.

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## THE MECHANISM OF THE MOUTH PARTS OF THE SQUASH BUG, *ANASA TRISTIS* DEGEER.<sup>1</sup>

By DANIEL G. TOWER, B.S.,

In preparing a previous paper dealing with the external anatomy of the squash bug (Tower, '13) it was found necessary to work out the structure of the mouth parts and internal anatomy of the head region. The mouth parts proved to be so interesting that a study more detailed than was possible in a general consideration of the anatomy has been made, the results being incorporated in the present paper. A brief description of the external region of the head and its parts has also been included so that one may more readily orient himself as to the relation of the parts to one another.

At this point I wish to thank Dr. H. T. Fernald for his assistance and the loan of books and pamphlets from his private library; and Dr. G. C. Crampton, who has directed my work and greatly assisted me in preparing this paper for publication.

As the sclerites of the head capsule are solidly fused together the general regions are all that can be described. Of these the occiput (occ), see Pl. 1 f. 1, lies behind the ocelli (oc) and forms the posterior portion of the head surrounding the occipital foramen. It is marked off by a shallow transverse groove, from the vertex. The vertex or cranium (v) comprises the dorsal region in front of the occiput and bears the ocelli. This area is not marked off from the frons (f), which lies above and between the bases of the antennæ. The anterior margin of the frons is united with the base of the clypeus (c).

Below and on either side of the compound eyes (e) lie the genæ (g), while the ventral posterior portion of the head capsule forms

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<sup>1</sup> Contribution from the Entomological Laboratory, Massachusetts Agricultural College.